



Nuna Innovations Inc.



**CCHYDRO**<sup>TM</sup>

*Concrete Impregnated Containment*

 1.855.815.4385  [sales@nunainnovations.com](mailto:sales@nunainnovations.com)  [nunainnovations.com](http://nunainnovations.com)



### What is it?

CC Hydro™ is a revolutionary new containment product from Concrete Canvas Ltd. It combines the company's concrete impregnated fabric technology with a high impermeability, chemically resistant geomembrane backing. The geomembrane provides a high performance liner with a testable joint for quality assured containment applications. The liner incorporates a hi-visibility welding strip allowing joints to be thermally bonded with a twin-track air channel for on-site testing.

The flexible concrete impregnated fabric, hardens on hydration, to provide long term protection to the geomembrane from puncture, abrasion, weathering and UV degradation. This hard armour concrete surface effectively removes the need for concrete, soil or aggregate top cover, normally required with conventional liner systems. CC Hydro™ is available in 2 thicknesses; CCH5™ and CCH8™ (5 and 8mm) for a wide range of containment applications.

### CC Hydro™ User Benefits

#### All-In-One Solution

CC Hydro™ combines the impermeability of a containment liner with the hard armour protection and durability of concrete, reducing install times and simplifying logistics.

#### No Top Cover

CC Hydro™ does not require a protective top cover. This removes the need for additional excavation, the treatment of contaminated arisings and the import of costly fill material.

#### Maintains Volume Capacity

CC Hydro™ can be laid directly onto existing profiles without loss of volume capacity for refurbishment projects, providing significant overall time and cost savings.

#### Reduced Life-Cycle Costs

CC Hydro™ provides effective weed suppression eliminating the ongoing maintenance cost of soil covered systems. CC Hydro™ also reduces the end-of-life costs associated with treatment of any contaminated top cover.

### CC Hydro™ Key Properties

#### High Impermeability

CC Hydro™ has excellent impermeability and has been independently tested to BS-EN-1377 to have a hydraulic conductivity better than  $1 \times 10^{-12}$  m/s.

#### Durable

CC Hydro™ has a hard armour surface, protecting the geomembrane liner from puncture, abrasion, weathering, burrowing animals and UV degradation.

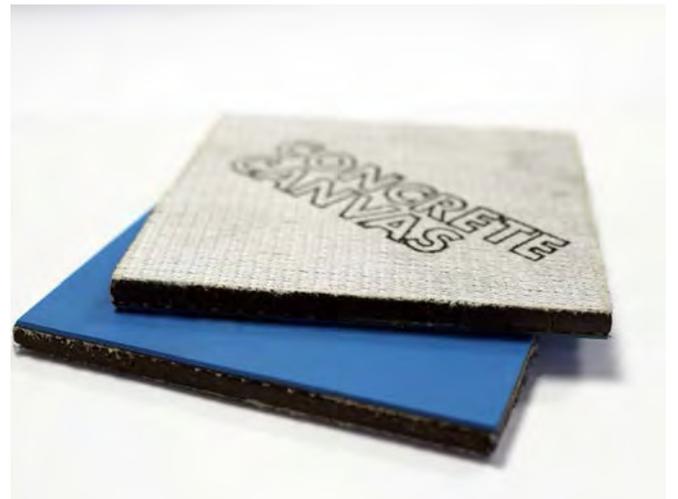
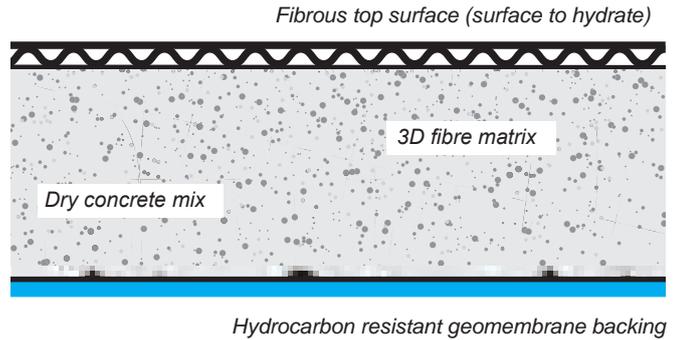
#### Chemical Resistance

CC Hydro™ has been shown to have excellent resistance to a wide range of chemical reagents, including hydrocarbons, digestates and acidic leachates.

#### Testible Joints

CC Hydro™ incorporates a high-visibility welding strip, allowing the joint to be thermally bonded with a twin-track air channel for fast and simple on-site pressure testing.

### CC Hydro™ section



CC Hydro™ swatches



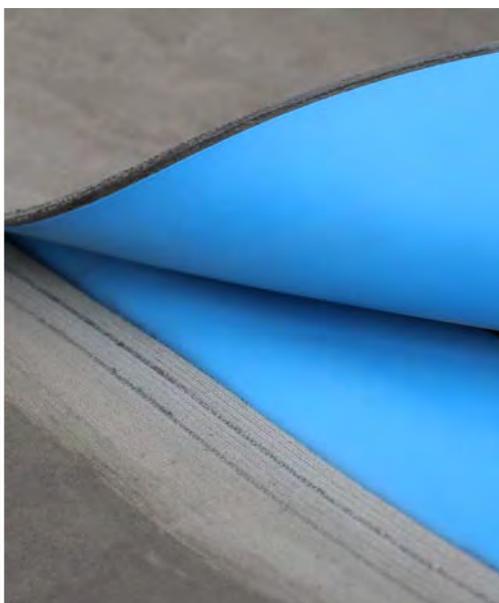
CC Hydro™ Bulk roll

## CC Hydro™ Applications

### Bund Lining



CC Hydro™ can be used to provide a durable, chemically resistant, high impermeability liner for secondary containment applications. Combining the flexibility of a geomembrane with the hard armour protection of concrete, CC Hydro™ can be used for bund and berm lining across a wide range of sectors including petrochemical, anaerobic digestion and mine tailings. **Concrete Canvas Ltd currently supply 7 out of the top 10 oil and gas operators worldwide.**



### Channel Lining

CC Hydro™ can be rapidly unrolled to provide a high impermeability ditch, flume or canal lining for drainage, irrigation or hydroelectric schemes; providing flow characteristics similar to smooth concrete (mannings = 0.011) and abrasion resistance more than double that of standard concrete (OPC).

### Lagoon Lining

CC Hydro™ provides a cost-effective primary containment solution for lagoon lining for water, tailings or chemical storage; providing excellent puncture resistance, UV protection and long term durability.

### Other

CC Hydro™ can be used for a wide range of containment applications where impermeability and durability are critical, whether it be new-build or the remediation of existing infrastructure.

## CC Hydro™ GCCM Material Data



## CC Hydro™ GCCM Physical Properties\*

Product	Concrete Thickness (mm)	Bulk Roll Size (sqm)	Roll Width (m)
CCH5™	5	150	1.0
CCH8™	8	100	1.1

Product	Mass (unset) (kg/m <sup>2</sup> )	Concrete Density (unset) (kg/m <sup>3</sup> )	Density (set) (kg/m <sup>3</sup> )
CCH5™	9.2	1500	+30-35%
CCH8™	14.2	1500	+30-35%

## Pre-Set CC Hydro™ GCCM Properties

### Setting

#### Working Time

1-2 hours subject to ambient temperature  
CC will achieve 80% strength at 24 hours after hydration.

### Method of Hydration

**Spray the fibre surface with water until it feels wet to touch for several minutes after spraying.**

#### Re-spray the CC again after 1 hour if:

- Installing CCH5™
- Installing on a steep or vertical surface

#### Notes:

- An excess of water is always recommended. CC Hydro™ will set underwater and in seawater.
- CC Hydro™ must be actively hydrated. For example do not rely on rainfall or snowmelt.
- Use a spray nozzle for the best results (see CC Hydro™ equipment list). Do not jet high pressure water directly onto the CC Hydro™ as this may wash a channel in the unset CC Hydro™.
- CC Hydro™ has a working time of 1-2 hours after hydration. Do not move or traffic CC Hydro™ once it has begun to set.
- Working time will be reduced in hot climates and increased in very cold climates.
- CC Hydro™ will set hard in 24 hours but will continue to gain strength over time.
- If CC Hydro™ is not sufficiently wetted, or dries out in the first 5 hours, the set may be delayed and strength reduced. If the set is delayed avoid trafficking the material and re-wet with an excess of water.

**Refer to the Concrete Canvas Hydration Guide for installation in low temperatures or drying conditions.**

- Low Temperature Conditions occur the ground surface temperature is between 0 and 5°C and rising or is expected to fall below 0°C in the 8 hours following hydration.
- Drying Conditions occur when there is one or more of: high air temperature (>22°C), wind (> 12km/h), strong direct sunlight or low humidity (<70%).

## Post Set CC Hydro™ GCCM Properties

Based on Concrete Canvas GCCM® hydrated in accordance with the Concrete Canvas® Hydration Guide.

### Strength

Very high early strength is a fundamental characteristic of CC Hydro™. Typical strengths and characteristics are as follows:

**Compressive** tests based on ASTM C109 – 02 (initial crack)  
- 10 day compressive failure stress (MPa) 40

**Bending** tests based on BS EN 12467:2004 (initial crack)  
- 10 day bending failure stress (MPa) 3.4

### Impermeability

BS EN 1377 - Water (m/s) 7.5x10<sup>-13</sup>  
BS EN 1377 - Diesel (m/s) 1.6x10<sup>-12</sup>

### Reaction to Fire

CC has achieved **Euroclass B certification**:  
BS EN 13501-1:2007+A1:2009 B-s1, d0

Flame Resistance: **MSHA ASTP-5011**  
Vertical and Horizontal Certification Passed

### Age Testing (minimum 50 year expected life)

**Freeze-Thaw** testing (ASTM C1185) 200 Cycles

**Freeze-Thaw** testing (BS EN 12467:2004 part 7.4.1) Passed

**Soak-Dry** testing (BS EN 12467:2004 part 5.5.5) Passed

**Heat-Rain** testing (BS EN 12467:2004 part 7.4.2) Passed

**Water impermeability** (BS EN 12467:2004 part 5.4.4) Passed\*\*

### Other

#### Puncture Resistance CC5™

Mean Max Puncture Force (kN) 2.4  
Mean Max Displacement (mm) 94.1

#### Abrasion Resistance (ASTM C-1353)

Approximately 7.5x greater than 17MPa OPC Passed

#### Manning's Value (ASTM D6460)

n = 0.011

#### Root Resistance (DD CEN/TS 14416:2005)

Passed

#### Chemical Resistance (BS EN 14414)

- Acid (pH 1.0) (56 day immersion at 50°C) Passed

- Alkaline (pH 13.0) (56 day immersion at 50°C) Passed

- Hydrocarbon (56 day immersion at 50°C) Passed

- Sulfate Resistance (28 day immersion at pH 7.2) Passed

#### Impact Resistance of Pipeline Coatings

ASTM G13 (CC13™ only) Passed

#### Permissible Shear & Velocity CC8™ (ASTM D-6460)

- Shear (Pa) 1200

- Velocity (m/s) 10.7

Product exceeded large scale testing capabilities and was not tested to failure.

To achieve these permissible values, the CC material must be properly anchored with a system designed to meet or exceed these values.

## Other Information

\* Occasionally there will be a Beam Fault (fabric imperfection under 100mm wide running across the width) in a Bulk Roll. This fault is unavoidable due to the manufacturing process and the fault will be clearly marked with a red tag, there will be a maximum of (1) one Beam Fault in any Bulk Roll. A joint may need to be made on site where there is a Beam Fault as the material at a fault will not reach the performance specified in this Data Sheet. The maximum un-useable material due to any Beam Fault will be 100mm. There are no beam faults in standard batched rolls.

\* Indicative values

The information contained herein is offered free of charge and is, to the best of our knowledge, accurate. However, since the circumstances and conditions in which such information and the products discussed therein can be used may vary and are beyond our control, we make no warranty, express or implied, of merchantability, fitness or otherwise, or against patent infringement, and we accept no liability, with respect to or arising from use of such information or any such product.

